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Notes on North American Willows, with a description of new or imperfectly known species. I.

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Since the publication of the Flora of California, much additional knowledge has been gained concerning American glaucoid willows. The genuine *Glaucæ*, in their extension southward within the boundary of the United States, are restricted to the Rocky mountains and Wasatch range—in a word, keep east of the Great Basin, with this exception, that on some of the highest peaks of the Sierra Nevada, at altitudes varying from 10,000 to 12,000 feet, a very peculiar form of *Salix* (*glauca*) *villosa* was collected years ago, on Mt. Hoffman and Wood's Peak by Prof. Brewer, on Mt. Whitney by Prof. Rothrock. Upon the evidence afforded by these three collections this species was given a place in the Flora of California, and although ten years have since elapsed they still remain, unsupported by further findings, to attest the occurrence of any form of *S. glauca* west of the Great Basin. Mr. Watson's no. 1099 (*Bot. King Exped.* p. 325), from the East Humboldt mountains of Nevada, alt. 9,000 feet, is the same plant.

Taking now the allied forms of the Sierra Nevada and Cascade ranges, we have, first, the well known *S. Californica*, more clearly distinguished from all forms of the *Glaucæ* by its glandular-serrulate leaves, green both sides, entire style and entire erect stigmas, than was at first believed. This, so far as known, is peculiar to the Sierra Nevada, and not found beyond the limits of the state for which it is named. Going northward, we next come to a species of the Cascades and Blue mountains, not heretofore recognized, sharing with *S. Californica* the characters above mentioned, but adding to them several very striking ones verging toward the *Cordatæ*, viz.: glabrous capsules, shorter style and stigma and very conspicuous stipules. This species finds its easternmost limit on some rugged peaks near Snake river, part of the Idaho system. Finally, this, in turn, is replaced on Mt. Adams by still another species exhibiting a still further approach to the *Cordatæ*, as I have indicated in the description. This ranges from Mt. Adams far northward,

spreading over to the Rocky mountains in Montana, and approximating in character several very diverse northern species.

The geographical distribution of these species in connection with their order of sequence in natural affinity is curious. Even in British Columbia, before the boundary of the United States is reached, it is observed that the Rocky mountains mark the western limit of *S. villosa*. Prof. Macoun says, "under a number of forms this variety extends from the eastern side of the Rocky mountains at Morley to the summit of the Selkirks (51°) and northwestward"¹—that is, along the trend of the mountains. It follows the mountains southward also, spreads over the Wasatch range, and then skipping from peak to peak, as it were, finds a rare lodgment on a few of the highest summits of the Sierra Nevada. Has this any significance, in connection with the strange fact that in the group which we have been considering as restricted to the mountains west of the Great Basin, a group intermediate in character between the *Glaucæ* and the *Cordatæ*, *it is at the south that the variation toward S. glauca occurs and at the north the transition toward S. cordata?*

Taking *S. commutata* as combining in the most remarkable manner *glauca*-like and *cordata*-like characteristics, we must apparently trace its connection with *S. glauca* southward around the southern extremity of, or by leaps across, the Great Basin, and thence northward along the Rocky mountains to Alaska, while directly northward there is a manifest fading out of glaucoid characteristics and accession of those leading toward *S. cordata*. And this notwithstanding the fact that genuine *S. glauca* is found on the coast of Alaska. Between Oregon and Alaska I do not know of a willow so nearly allied to *S. glauca* as this plant of the Blue mountains and the Cascades.

***S. commutata*, n. sp.** A diffuse alpine shrub of variable stature, commonly 3 to 4 feet in height, in sheltered localities 8 to 10 feet, often much dwarfed by altitude and exposure: leaves broadly oblanceolate or oblong, abruptly pointed, cuspidate, tapering toward the roundish base, at first covered more or less with a dense silky tomentum, downy even when fully grown; older and lower leaves becoming smooth, green both sides (not glaucous beneath), margin entire or (under a lens) minutely glandular-serrulate; leaves of sterile shoots ample, 3 to 4 inches long, varying to cordate-ovate, thinnish

¹ Cat. Canadian Plants, p. 449.

in texture; stipules large, ovate, glandular-serrate: aments on stout leafy peduncles with 4 to 7 ovate or oblanceolate leaves, erect, densely flowered, an inch long; fertile in fruit 2 inches, compact, cylindrical; scale thin, pale or brownish, obtuse, woolly; capsule ovate-conical, glabrous, greenish or rufescent; pedicel pubescent, 2 to 3 times the length of the nectary; style medium, stigmas small, erect, entire.

Var. sericea. Young leaves densely white tomentose, entire.

Var. denudata. Young leaves smooth or nearly so, more distinctly serrulate.

Var. puberula. Capsule thinly puberulous. Transition to *S. Californica*.

Alpine bogs, Eagle Creek mountains near Snake river, in great abundance, also in the Blue mountains, where it appears to be limited to a small district, *Cusick*; Cascade Mts., Washington Territory, alt. 6,400 ft., *Tweedy*. **Var. sericea**, moraines near the snow line on the north side of Mt. Hood, *Howell*, *Henderson*. **Var. denudata**, Eagle creek meadows, *Cusick*; Cascade Mts., Washington Territory, *Tweedy*.

In its glabrous rufescent capsules, entire style and short erect entire stigmas, and in its large serrulate stipules this species obviously resembles *S. cordata*; while on the other hand the whole habit of the plant, the broad softly tomentose subentire leaves, the stout leafy peduncles and sessile capsules are like *S. glauca*.

***S. conjuncta*, n. sp.** Leaves of the flowering branches elliptic or obovate, subacute, 1 to $1\frac{1}{2}$ in. long; leaves of the sterile branches ample, 2 to 4 in. long, 1 to 2 in. wide, ovate-lanceolate, cuspidate-acuminate, attenuate or rounded at base; stipules large, ovate, acute; all glabrous or at first thinly overspread on the upper surface with evanescent floccose hairs, at length rigid, scarcely paler or rarely subglaucous beneath, young drying black, margins finely and evenly crenate-serrulate: aments borne on stout leafy peduncles, large, thick, 1 to 2 in. long; fertile becoming rather loose and flexuose in fruit (lengthening sometimes to 3 in.); scale acutish, dark, villous with crisp hairs, sometimes densely or again thinly hairy or quite naked at the tip; capsule glabrous, rostrate from an ovate base; pedicel 3 times the length of the nectary; style medium or elongated, about equaling the pedicel, stigmas short, entire or bifid.

In wet meadows and along alpine rivulets, Mt. Adams, Washington Territory, *Parry*, *Howell*, *Suksdorf*, *Henderson*; Cascade Mts., alt. 5,500 ft., *Tweedy*; Bald mountain, S. W. Montana, alt. 7-8,000 ft., *Watson*; summit

of *S. Kootanie* pass, B. C., *Dawson*; Kicking Horse pass and on the Selkirk, *Macoun*; near Alaska, *Dawson*; Kodiak, *Kellogg*.

This combines characteristics of several diverse species, while differing from each in turn. It has been mistaken for *S. Barrattiana*, especially the form with thick woolly aments, but it differs in the smooth leaves, aments peduncled, capsules glabrous: accords in some respects very nearly with the character assigned *S. Barclayi*—a species of the Alaskan coast—but that has a much longer style and long slender reflexed stigmas: aments as in *S. cordata*, but leaves broader and shorter, drying black, capsules shorter pediceled; leaves, particularly of the flowering branches, like *S. montana* of the Rocky mountains, but that has closely sessile aments. The wide range over which this species preserves its character is a guarantee of its validity. On Mt. Adams it appears to replace, as it were, *S. commutata*, from which it is distinguished by the darker green leaves, often subglaucous beneath, distinctly crenate serrate, smooth (as in *S. phyllifolia*), drying black, aments more loosely flowered, capsules rostrate, perfectly smooth even to the pedicel, stigmas often bifid.

Rockford, Ill.

Some undescribed Hepaticæ from California.

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(WITH PLATES III—VI.)

Among botanical collectors on the Pacific coast, Dr. Henry N. Bolander has done more than all others to bring to light new forms of Hepaticæ, and his name is inseparably connected with species belonging to several genera. Much of the material which he collected was sent to Mr. Austin, who described numerous species from California. Some of his earlier collections, however, were sent to Dr. C. Gottsche in Altona, near Hamburg; among these are some that have never been described; camera tracings of four of these have been at Cambridge for some time. With the kind permission of both Dr. Gottsche and Dr. Watson I am able to publish these plates with the necessary descriptions, as well as the description of a fifth which is not represented in any of the larger herbaria of the country, but of which Dr. Gottsche has generously sent both specimens and a Latin diagnosis. The fact that these species have remained undescribed for twenty-two years is significant, as is also the fact that, so far as known, only one of the species has been collected a sec-